

Appl. No. : 10/038,305
Filed : January 2, 2002

REMARKS

Amendments to the Claims

Applicants have amended the claims to further clarify the subject matter that Applicants regard as the invention. For example, Applicants have rewritten Claim 6 in independent form, including all limitations of the original base claim, Claim 1. In light of this amendment and the cancellation of Claim 1, Applicants have also amended Claims 2-3, 5, 7 and 8 to depend from Claim 6 rather than Claim 1. Support for these amendments can be found in the Application as originally filed (*see, e.g.*, p. 8 of the Application) and in the original claims (*see, e.g.*, Claims 1 and 6).

In addition, Applicants have amended Claim 17 to remedy several obvious grammatical errors. In particular, a period in the middle of the claim has been replaced with a semicolon and the conjunction “and” has been added after the second semicolon to correctly, grammatically, join the various subordinate clauses in that claim.

Accordingly, Applicants respectfully submit that the amendments add no new matter and are fully supported by the application as originally filed. In addition, Applicants respectfully submit that the amendments introduce no new issues.

Anticipation Rejections

The Examiner has rejected Claims 1-2, 5-9, 11, 14-15 and 17-20 under 35 U.S.C. § 102(e) as being anticipated by Havemann (U.S. Patent No. 6,156,651). The Examiner stated that Havemann discloses “depositing a first metal (tungsten, 66, see col. 3, lines 19-21) ... selectively over the conductive element relative to insulating surfaces of the dual damascene structure to partially fill the contact via (see figure 6C), and filling a remainder of the contact via with a second metal (70, aluminum, see figure 6E, as claimed in claims 2, and 20) by PVD (see col. 6, lines 44-46), the second metal of aluminum being more conductive than the first metal of tungsten.”

The Examiner further stated that Havemann teaches that “depositing the first metal comprises filling the contact via to a height between about one-third and two-thirds or one half and two-thirds of a height of the contact via (see figure 6C).”

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Applicants respectfully traverse the rejections and submit that the pending claims distinguish the art of record.

In particular, Applicants submit that Havemann does not teach every limitation recited in the claims. Initially, Applicants note that all independent claims recite filling less than all of a “contact via” with a “first metal.” For example, currently amended Claim 6 recites “filling the contact via to a height between about **one-third and two-thirds** of a height of the contact via” and Claim 17 recites “depositing a first metal to fill between about **one-thirds and two-thirds** of the height of the contact via.” (emphasis added). Thus, all pending independent claims recite particular limits on the level up to which the “first metal” fills the “contact via[s].” Moreover, as discussed below, Applicants have found that these levels of “filling” is critically important balancing the needs for low resistivity “metal” structures and for conformal deposition of these “metal[s].”

In contrast, Applicants note that Havemann contains no discussion of and, thus, does not teach filling the “contact vias” to any particular level. The Examiner appears to have recognized this deficiency and, so, has referenced Figure 6C of Havemann as supporting the assertion that Havemann teaches that “depositing the first metal comprises filling the contact via to a height between about one-third and two-thirds or one half and two-thirds of a height of the contact via.” Applicants note, however, that Havemann merely states that “FIG. 6C shows the structure after deposition of selective metal” and gives no indication that the figure is drawn to scale, nor any other guidance as to the level that the “contact via” is filled. Havemann, Col. 6, lines 40-41.

Moreover, as discussed in the M.P.E.P., “it is well established that patent drawings do not define the precise proportions of the elements and may not be relied on to show particular sizes if the specification is completely silent on the issue.” M.P.E.P. §2125 (quoting *Hockerson-Halberstadt, Inc. v. Avia Group Int'l*, 222 F.3d 951, 956, 55 U.S.P.Q. 2d 1487, 1491 (Fed. Cir. 2000)). Consequently, because Havemann is silent about the particular level to which the “contact via” is “fill[ed]” and because Havemann does not indicate that the drawings are drawn to scale, Applicants submit that the Examiner has impermissibly relied upon the drawings to define the proportions of the conductor filling the “contact via” in Havemann’s Figure 6. However, because the Examiner may not rely upon the drawings for such a teaching, Applicants

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submit that Havemann does not teach every limitation of independent Claims 6 and 17 and, so, does not anticipate independent Claims 6 and 17.

Rather, Applicants submit that only Applicants have taught a method in which a less "conductive" "first metal," which advantageously is typically relatively easy to conformally deposit, is first deposited and then a "more conductive" "second metal," which is typically more difficult to conformally deposit, is deposited over the "first metal." Advantageously, by limiting the "height" to which the "contact via" is filled with the less "conductive metal," Applicants have found that the floor of the via can be sufficiently raised to allow the "more conductive metal" to be relatively easily deposited, but increases in the resistance of the resulting structure can be minimized. *See, e.g.*, the Application, p. 11. Applicants respectfully submit that the art of record does not teach nor suggest such an advantageous deposition scheme.

In addition, Applicants submit that the Examiner has misinterpreted the art of record. Applicants note that each independent claim recites a "second metal" over a "first metal," the "second metal" being "more conductive" than the "first metal." As support for the assertion that Havemann teaches a similar arrangement, the Examiner refers to Havemann's statement at Col. 3, lines 19-21: "[t]he conductors and vias of this invention will generally be either copper, tungsten or aluminum *or combinations thereof.*" (emphasis added). Applicants submit, however, that the phrase "combinations thereof" actually refers to "metal[s]" combined to form a single conductor, *e.g.*, as in an alloy, and does not refer to different combinations of pure "metal[s]" arranged over one another. This interpretation is made explicit in the claims, which recite "depositing a first conductor metal" and that "*said* conductor metal consists of essentially aluminum, tungsten, copper *or combinations thereof.*" *See* Havemann, Claims 1, 4, 12 and 20 (emphasis added).

As such, Applicants respectfully submit that Havemann does not disclose every element of independent Claims 6 and 17 and, so, does not anticipate these claims.

Obviousness Rejections

The Examiner has rejected Claims 3-4, 16, 12-13, 21-23 and 10 as being unpatentable over Havemann in view of various other references. In particular, the Examiner has applied

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Havemann as asserted against "claims 1-2, 5-9, 11, 14-15 and 17-20 above" and has applied the other references to satisfy various deficiencies of Havemann.

As discussed above, however, Havemann does not teach all that has been asserted. Havemann does not teach the particular level of filling of the contact via recited in independent Claims 6 and 17, nor does Havemann teach forming two different metals over one another, the "first metal" less conductive than the "second metal." Furthermore, none of the secondary references teach or suggest filling the contact via to "about one-thirds and two-thirds of the height of the contact via" with the "first metal" and filling "a remainder" of the via with the "second metal." Because the obviousness rejections depend upon such asserted teachings, Applicants respectfully submit that the obviousness rejections are moot in view of the comments above.

Accordingly, Applicants respectfully submit that the pending claims are allowable over the art of record. Applicants have not specifically addressed the rejections of dependent claims as being moot in view of the remarks herein, nor have Applicants specifically addressed the asserted teachings of the art of record apart from Havemann. However, Applicants expressly do not acquiesce in the Examiner's findings not addressed herein. Moreover, Applicants submit that the dependent claims recite further distinguishing and non-obvious features of particular utility.

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CONCLUSIONS

In view of the foregoing amendments and remarks, Applicants request entry of the amendments and submit that the application is in condition for allowance and respectfully request the same. If some issue remains which the Examiner feels may be addressed by Examiner's amendment, the Examiner is cordially invited to call the undersigned for authorization.

Respectfully submitted,

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